REMARKS/ARGUMENTS

Applicant appreciates the consideration shown by the Office, as evidenced by the Final Office Action mailed on 4 December 2006. In that Office Action, the Examiner allowed the subject matter of claim 81 and rejected claims 20, 22-76, and 79-80. After consideration of the Office Action, claim 20 has been amended, and claims 37-67 have been canceled. Claims 1-19, 21, and 77-78 had previously been canceled. Claims 20, 22-36, 68-76, and 79-81 are under consideration in the present application. Applicant respectfully requests reconsideration of the application by the Examiner in light of the above amendments and the following remarks.

Amendment of claim 20

Applicant noted a typing error in the previous amendment in that the inserted clause should have been inserted at the end of the claim rather than in the middle to provide sufficient antecedent basis. Applicant has cut and pasted the clause into the appropriate location and made no substantive change.

Gessinger – claims 20, 23-30, and 80

Claims 20, 23-30, and 80 were rejected under 35 USC 102(b) over Gessinger et al. US4380574.

Applicant submits that Gessinger does not disclose Applicant's claim 20 recitation of:

> the diffusion-controlling layer is a metal selected from the group consisting of pure metals or alloys that do not form brittle and/or low melting phases due to interaction with the erosion resistant protective structure or the substrate.

The one and only reference to such a layer in Gessinger is at column 4, lines 48-55:

> A limited diffusion in the boundary zone between the base material 1 and the surface layer 2 is permissible, as long as the layered build-up of the composite material is not impaired thereby. If necessary, an interlayer can be applied beforehand as a diffusion barrier. These considerations are to be taken into account particularly in the last-mentioned coating process

Thus, No particular reference to the material, type, or nature of the diffusion layer is provided by Gessinger. Applicant describes the benefits of the claimed layer in paragraphs 37-39 of Applicant's specification.

Applicant notes the following statements from the "Response to Arguments" on page 9 of the Office Action:

> As all solid metals have some level of brittleness due to hardness and as the term "low melting phase" is undefined as to what temperatures qualify as low melting, it is the Examiner's position that a diffusion layer as taught by Gessinger will have the claimed properties. This position is supported further with respect to the low melting phase requirement in that the diffusion barrier layer of Gessinger necessarily has heat resistance in use in thermal machine components and is therefore interpreted as being resistant to low temperature melting.

Because no description of the diffusion barrier material or properties is included in Gessinger, Applicant continues to traverse these statements. Applicant does not claim low temperature "melting" but instead references the "phases" resulting from interaction with the diffusion controlling layer relative to the substrate and the erosion resistant protective structure. Applicant also traverses the above Office action sentences with respect to "brittleness." One reason is that Applicant's claim is not simply one of a specific material being brittle or not but one of a material that does not form a brittle phase due to interaction with the erosion protective structure **or** the substrate.

Additionally, Applicant traverses the suggestion by the Office Action that all materials are brittle. As can be seen from the attached example of an internet dictionary definition of brittle at http://en.wikipedia.org/wiki/Brittle, there are different classes of materials with some being "brittle" and others being "deformable."

> A material is **brittle** if it is liable to fracture when subjected to stress i.e. it has little tendency to deform (or strain) before fracture. This fracture absorbs relatively little energy, even in materials of high strength, and usually makes a snapping sound.
>
> When used in materials science, it is generally applied to materials that fail in tension rather than shear, or when there is little or no evidence of plastic deformation before failure.
>
> When a material has reached the limit of its strength, it usually has the option of either deformation or fracture. A naturally malleable metal can be made stronger by impeding the mechanisms of plastic deformation (reducing grain size, dispersion strengthening, work hardening, etc.), but if this is taken to an extreme, fracture becomes the more likely outcome, and the material can become brittle. Improving material toughness is therefore a balancing act.
>
> This principle generalizes to other classes of material. Naturally brittle materials, such as ceramics (most famously glass), are difficult to toughen effectively. Most such techniques involve one of two mechanisms: to deflect the tip of a propagating crack, for instance by introducing natural weaknesses of limited extent, or to create carefully controlled residual stresses so that cracks from certain predictable sources will be forced closed, as in the case of toughened glass and pre-stressed concrete. Both mechanisms tend to soften the material somewhat, although most ceramics are quite hard to begin with. The least-brittle structural ceramics are silicon carbide (mainly by virtue of its high strength) and transformation-toughened zirconia.
>
> Generally, the ***brittle strength*** of a material can be increased by pressure. This happens as an example in the brittle-ductile transition zone at an approximate depth of 10 km in the Earth's crust, at which rock becomes less likely to fracture, and more likely to deform ductilely.
>
> Supersonic fracture is crack motion faster than the speed of sound in a **brittle** material. This phenomenon was first discovered by scientists from the Max Planck Institute for Metals Research in Stuttgart (Markus J. Buehler and Huajian Gao) and IBM Almaden Research Center in San Jose, California (Farid F. Abraham).
> Retrieved from "http://en.wikipedia.org/wiki/Brittle"

Accordingly, Applicant respectfully submits that claim 20 and claims 23-30 and 80 which depend therefrom define allowable subject matter over Gessinger.

EP077 – claims 20, 22-35, and 67

Claims 20, 22-35, and 67 were rejected under 35 USC 102(b) over EP1054077 (EP077). Although Applicant respectfully traverses the rejection, the method claims, including claim 67, have been canceled to provider clearer focus with respect to the structure claims. With respect to independent claim

20, EP077 does not describe a shape memory alloy, erosion resistance, and or avoidance of brittle and/or low melting phases between the diffusion controlling layer and a substrate and an erosion protective coating comprising a shape memory alloy.

EP077 appears to describe a titanium article having an environmental protective coating (paragraph 0003) which is also referenced as providing oxidation and corrosion protection and which is illustrated as comprising austenitic steel in one example (paragraph 0009). A barrier layer between the "titanium alloy article" and the "austenitic steel" is referenced at paragraph 0026 and described in more detail at paragraph 0040:

> The embodiment in figure 3 is substantially the same as that in figure 2 but differs in that a barrier layer 24 is provided between the titanium aluminide turbine blade 10 and the protective coating 20. The barrier layer 24 comprises silica, titanium nitride, titanium aluminum nitride or alumina. Other suitable barrier layers are aluminum, cobalt, nickel, iron, silicon, niobium and alloys or compounds of these elements. The barrier layer 24 prevents interdiffusion between the titanium aluminide 10 and the protective austenitic stainless steel coating 20 which may result in the formation of undesirable phases at the interface between the titanium aluminide 10 and the protective austenitic stainless steel coating 20.

Thus, although one of Applicant's listed materials of niobium is positioned in the middle of the second string of potential barrier layer materials in EP077, it is not in the context of use with an erosion protective shape metal alloy.

Accordingly, Applicant respectfully submits that claim 20 and claims 22-35 which depend therefrom define allowable subject matter over EP077.

Gessinger and EP077 – claim 22

Claim 22 was rejected under 35 USC 103(a) over Gessinger and EP077. Claim 22 depends from claim 20 which Applicants believes to be in condition for allowance over Gessinger and EP077 for the reasons described above regardless of whether EP077 references niobium. Furthermore, Applicant submits that the fact that niobium was listed as a potential material for use between titanium aluminide and an austenitic steel does not make it obvious to insert niobium or the other materials recited in claim 22 between a titanium alloy and a shape memory alloy erosion protective coating.

EP077 – claim 36

Claim 36 was rejected under 35 USC 103(a) over EP077. Claim 36 depends from claim 20 which Applicant believes to be in condition for allowance over EP077 regardless of whether particle size is taught or suggested by EP077.

EP077 and WO102 – Claims 37-51

Although Applicant respectfully traverses the rejection, claims 37-51 have be canceled.

EP077 and WO102 – Claims 52-66

Although Applicant respectfully traverses the rejection, Claims 52-66 have be canceled.

EP077 – Claims 68-76 and 79

Claims 68-76 and 79 were rejected under 35 USC 103(a) over EP077. Claim 68 includes diffusion layer description language similar to that of above-discussed claim 20 and is believed to be in condition for allowance over EP077 for that reason. Claims 69-76 and 79 each depend from claim 68.

Gessinger and Gowda – Claim 80

Claim 80 was rejected under 35 USC 103(a) over Gessinger in view of Gowda US7093423. Claim 80 depends from claim 20 which Applicant believes to be in condition for allowance over Gessinger regardless of whether Gowda describes that NiTiFe is a shape memory alloy material.

Claim 81

The Office Action indicated that dependent claim 81 included allowable subject matter. Claim 81 depends from claims 20 and 80 which are believed to be in condition for allowance for the reasons discussed above. Therefore, Applicant has not rewritten claim 81 in independent form.

Summary

Should the Examiner believe that anything further is needed to place the application in better condition for allowance, the Examiner is requested to contact applicant's undersigned representative at the telephone number below.

Respectfully submitted,

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